

SECTION I

Fundamentals, 1

1. Fundamentals: Essential Technology, Concepts, and Capability, 2

ASHOT E. SARGSYAN | MICHAEL BLAIVAS | PHILIP LUMB | DIMITRIOS KARAKITSOS

SECTION II

Neurocritical Care, 24

2. Transcranial Doppler Ultrasound in Neurocritical Care, 25

JEFFREY BODLE | ZSOLT GARAMI | DIMITRIOS KARAKITSOS | CHRISTOS LAZARIDIS

3. Transcranial Doppler in Aneurysmal Subarachnoid Hemorrhage-Consultant Level Examination, 32

SCOTT A. MARSHALL | JOHN D. KLEIN | ALEXANDER H. VO | ALEXANDER RAZUMOVSKY

4. Transcranial Doppler in the Diagnosis of Cerebral Circulatory Arrest-Consultant Level Examination, 36

JOHN POULARAS | GREGORIOS KOURAKLIS | MICHAEL BLAIVAS | DIMITRIOS KARAKITSOS

5. Use of Transcranial Doppler Ultrasonography in the Pediatric Intensive Care Unit-Consultant Level Examination, 40

SUZANNE VERLHAC | CHARLOTTE MICHOT

6. Ocular Ultrasound in the Intensive Care Unit-Consultant Level Examination, 45

ASHOT E. SARGSYAN | MICHAEL BLAIVAS | THOMAS GEERAERTS | DIMITRIOS KARAKITSOS

7. General Chest Ultrasound in Neurocritical Care, 51

MOHAMMED REHMAN | CHRISTOS LAZARIDIS

SECTION III

Vascular Ultrasound, 54

8. Overview of the Arterial System, 55

DIMITRIOS KARAKITSOS | GLYKERIA PETROCHEILOU | SHIWEN WANG | MICHAEL BLAIVAS | NICOS LABROPOULOS

9. Ultrasonography for Deep Venous Thrombosis, 60

GULRUKH ZAIDI | RUBIN I. COHEN | ADEY TSEGAYE

10. Ultrasound-Guided Central Venous Access: The Basics, 66

AHMED LABIB | ANDREW BODENHAM

11. Ultrasound-Guided Vascular Access: Trends and Perspectives, 71

ARIEL L. SHILOH | LEWIS A. EISEN | MICHAEL BLAIVAS | DIMITRIOS KARAKITSOS

12. How to Choose the Most Appropriate Ultrasound-Guided Approach for Central Line Insertion: Introducing the Rapid Central Venous Assessment Protocol, 76

MAURO PITTIRUTI | ANTONIO LA GRECA

13. Pediatric Ultrasound-Guided Vascular Access, 80

MAHMOUD ELBARBARY | MAURO PITTIRUTI | MASSIMO LAMPERTI

14. Ultrasound-Guided Peripheral Intravenous Access, 86

SHEA C. GREGG | CHARLES A. ADAMS, JR.

15. Ultrasound-Guided Placement of Peripherally Inserted Central Venous Catheters, 89

GIANCARLO SCOPPETTUOLO | MAURO PITTIRUTI

16. Ultrasound-Guided Arterial Catheterization, 95

ARIEL L. SHILOH | RICHARD H. SAVEL | LEWIS A. EISEN

17. Intravascular Ultrasound-Consultant Level Examination, 99

HAIYUN WU | YU WANG

18. Ultrasound-Guided Placement of Inferior Vena Cava Filters-Consultant Level Examination, 101

RAM K R GURAJALA | AMANJIT GILL

SECTION IV

General Chest Ultrasound, 105

19. Lung Ultrasound: The Basics, 106

SAHAR AHMAD | LEWIS A. EISEN

20. Pleural Ultrasound, 111

KIMMOI WONG LAMA | ASTHA CHICHRA | RUBIN I. COHEN | MANGALA NARASIMHAN

21. Lung Ultrasound in Trauma, 115GIOVANNI VOLPICELLI | MATTIA TULLIO |
ALESSANDRO LAMORTE**22. Lung Ultrasound in Acute Respiratory Distress Syndrome (ARDS), 119**FRANCESCO CORRADI | CLAUDIA BRUSASCO |
MARCELO GAMA DE ABREU | PAOLO PELOSI**23. Lung Ultrasound in Mechanically Ventilated Patients, 123**OWEN MOONEY | ANDREW W. KIRKPATRICK |
LAWRENCE M. GILLMAN**24. Lung Ultrasound: Protocols in Acute Dyspnea, 128**

CARLA VENEGAS | LEWIS A. EISEN | ARIEL L. SHILOH

25. Endobronchial Ultrasound-Consultant Level Examination, 131

SEPTIMIU MURGU | HENRI COLT

SECTION V**Echocardiography, 138****26. Transthoracic Echocardiography: An Overview, 139**

DAVID J. STURGESS

27. Echocardiography for Intensivists, 146

PHILIPPE VIGNON

28. Echocardiography: Beyond the Basics-Consultant Level Examination, 154

BENEDICT WALDRON | GUIDO TAVAZZI | SUSANNA PRICE

29. Transesophageal Echocardiography, 160

DAVID DUTHIE | SUSANNA PRICE

30. Echocardiography in Cardiac Trauma, 168

ALEXANDER BECKER | GUY LIN

31. Echocardiography in Cardiac Arrest, 171

MARY WHITE | SUSANNA PRICE

32. Evaluation of Left Ventricular Diastolic Function in the Intensive Care Unit - Consultant Level Examination, 175

JULIEN MAIZEL | SHARI EL-DASH | MICHEL SLAMA

33. Evaluation of Right Ventricular Function in the Intensive Care Unit by Echocardiography-Consultant Level Examination, 179MICHEL SLAMA | JULIEN MAIZEL | YAZINE MAHJOUR |
SHARI EL-DASH**34. Evaluation of Patients at High Risk for Weaning Failure with Doppler Echocardiography-Consultant Level Examination, 185**

PHILIPPE VIGNON

35. Improving Cardiovascular Imaging Diagnostics by Using Patient-Specific Numerical Simulations and Biomechanical Analysis, 190MICHAEL XENOS | DIMITRIOS KARAKITSOS |
DANNY BLUESTEIN**SECTION VI****Hemodynamics, 193****36. Hemodynamic Monitoring Considerations in the Intensive Care Unit, 194**DAVID J. STURGESS | DOUGLAS R. HAMILTON |
ASHOT E. SARGSYAN | PHILIP LUMB |
DIMITRIOS KARAKITSOS**37. Measures of Volume Status in the Intensive Care Unit, 200**

DIETRICH HASPER | JÖRG C. SCHEFOLD | JAN M. KRUSE

38. Evaluation of Fluid Responsiveness by Ultrasound, 203

DANIEL DE BACKER | DAVID FAGNOUL

39. Ultrasonography in Circulatory Failure, 207JUSTIN WEINER | JOSE CARDENAS-GARCIA | RUBIN I.
COHEN | SETH KOENIG**40. Perioperative Sonographic Monitoring in Cardiovascular Surgery, 211**

DANIEL DE BACKER | DAVID FAGNOUL

SECTION VII**Abdominal and Emergency Ultrasound, 214****41. Various Targets in the Abdomen (Hepatobiliary System, Spleen, Pancreas, Gastrointestinal Tract, and Peritoneum)-Consultant Level Examination, 215**GLYKERIA PETROCHEILOU | JOHN POULARAS |
EMMANUEL DOUZINAS | ARIEL L. SHILOH |
HEIDI LEE FRANKEL | MICHAEL BLAIVAS |
DIMITRIOS KARAKITSOS**42. Approach to the Urogenital System, 224**DIMITRIOS KARAKITSOS | GEORGIOS ANYFANTAKIS |
ABRAHAM A. GHIATAS | MICHAEL BLAIVAS**43. Point-of-Care Pelvic Ultrasound, 229**

LORI STOLZ | SRIKAR ADHIKARI

- 44. Procedural Ultrasound for Surgeons-Consultant Level Examination, 234**
JADEN EVANS | SARAH AHMAD | SHARMILA DISSANAIKE
- 55. Ultrasound in Animals, 290**
GREGORY R. LISCIANDRO

- 45. The Extended FAST Protocol, 238**
YEKATERINA GREWAL | ARIEL L. SHILOH | LEWIS A. EISEN

- 46. Use of Ultrasound in the Evaluation and Treatment of Intraabdominal Hypertension and Abdominal Compartment Syndrome, 241**
KHANJAN H. NAGARSHETH | HEIDI LEE FRANKEL

SECTION VIII Specialized Settings, 244

- 47. Ultrasound in the Neonatal and Pediatric Intensive Care Unit, 245**
MAHMOUD ELBARBARY | DIMITRIOS KARAKITSOS

- 48. Integrating Ultrasound in Emergency Prehospital Settings, 251**
MANSOOR KHAN | SARAH MURTHI | HEIDI LEE FRANKEL | THOMAS M. SCALEA

- 49. Use of Ultrasound in War Zones, 254**
JASON D. HEINER | ERIC J. CHIN

- 50. Ultrasound Imaging in Space Flight, 258**
ASHOT E. SARGSYAN | DIMITRIOS KARAKITSOS

SECTION IX Special Techniques and Applications, 263

- 51. Soft Tissue, Musculoskeletal System, and Miscellaneous Targets, 264**
ASHOT E. SARGSYAN | GLYKERIA PETROCHEILOU | SERAFIM NANAS | ARIEL L. SHILOH | HEIDI LEE FRANKEL | DIMITRIOS KARAKITSOS

- 52. Ultrasound-Guided Percutaneous Tracheostomy, 272**
AHMED LABIB | ANDREW BODENHAM

- 53. Ultrasound-Guided Regional Anesthesia in the Intensive Care Unit, 274**
BETTINA U. SCHMITZ | MARIA MATUSZCZAK | MARCO A. FONDI | SARA GUZMAN-REYES | LUDWIG H. LIN | SAMER NAROUIZE

- 54. Ultrasound in Reconstructive Microsurgery-Consultant Level Examination, 288**
ANDREAS GRAVVANIS | DIMOSTHENIS TSOUTSOS | APOSTOLOS E. PAPALOIS | DIMITRIOS KARAKITSOS

SECTION X HOLA Logistics and The Ultrasound Experience / Training/ Credentialing, 294

- 56. Integrating Picture Archiving and Communication Systems and Computerized Provider Order Entry into the Intensive Care Unit: The Challenge of Delivering Health Information Technology-Enabled Innovation, 295**

ANDREW GEORGIU | ISLA M. HAINS | DAVID MILLISS | LLOYD RIDLEY | JOHANNA I. WESTBROOK

- 57. The Holistic Approach Ultrasound Concept and the Role of Critical Care Ultrasound Laboratory, 298**

ASHOT E. SARGSYAN | MICHAEL BLAIVAS | DIMITRIOS KARAKITSOS

- 58. Ultrasound: A Basic Clinical Competency, 303**

RICHARD HOPPMANN

- 59. Integrating Ultrasound into Critical Care Teaching Rounds, 306**

SASSIA DONALDSON-MORGAN | MICHAEL YEE | LEWIS A. EISEN

- 60. Training and Competence in Ultrasound-Guided Vascular Access, 308**

MASSIMO LAMPERTI

- 61. Training in Critical Care Echocardiography: Both Sides of the Atlantic, 312**

PAUL H. MAYO | SUSANNA PRICE

- 62. Ultrasound Training in Critical Care Medicine Fellowships, 316**

JENNIFER HOWES | ARIEL L. SHILOH | ADAM KEENE | LEWIS A. EISEN

Index, 319

VIDEO CONTENT

- Video 1-1:** A typical ultrasound machine (previous generation) and its basic functions
- Video 1-2:** Demonstrated e-FAST ultrasound examination
- Video 1-3:** Basic and adjunct imaging modes
- Video 1-4:** Limitations of transthoracic echocardiography in the intensive care unit
- Video 4-1:** The “beacon signal” depicted on transcranial color-coded Doppler in brain-death: transitory ‘flickering’ of cerebral circulation
- Video 4-2:** The “beacon signal” depicted on transcranial color-coded Doppler in brain death: left ophthalmic artery
- Video 6-1:** Sonographic depiction of the pupillary light reflex (PLR)
- Video 11-1:** A normal vein collapses with probe pressure
- Video 23-1:** Point-of-care lung sonogram during a recruitment maneuver
- Video 23-2:** Point-of-care lung ultrasound during HFOV: confirming the absence of a pneumothorax by the presence of lung sliding and comet tail artifacts
- Video 23-3:** Point-of-care lung ultrasound during HFOV: suggesting the presence of a pneumothorax by the absence of lung sliding and comet tail artifacts
- Video 23-4:** Point-of-care lung ultrasound during HFOV: confirming the presence of a pneumothorax by the presence of a lung point (arrow)
- Video 27-1:** Transthoracic echocardiography performed in a ventilated child with septic shock
- Video 27-2:** Transthoracic echocardiography depicting the effects of inotropes on left ventricular fractional area change
- Video 27-3:** Ruptured papillary muscle complicating an acute myocardial infarction depicted by transesophageal echocardiography in a ventilated patient with severe pulmonary edema and shock
- Video 27-4:** Acute mitral regurgitation secondary to ruptured posterior papillary muscle disclosed by transesophageal echocardiography
- Video 27-5:** Transesophageal echocardiographic long axis view of the ascending aorta in a ventilated patient referred for acute aortic syndrome and shock
- Video 27-6:** Transesophageal echocardiography performed in a ventilated patient after a resuscitated cardiac arrest
- Video 27-7:** Localized cardiac tamponade identified by transesophageal echocardiography in a ventilated patient with shock after open-heart surgery

- Video 27-8:** Takotsubo cardiomyopathy diagnosed using transthoracic echocardiography in a patient presenting with severe subarachnoid hemorrhage
- Video 27-9:** Chronic cor pulmonale evidenced using transthoracic echocardiography in a patient presenting with a decompensated severe chronic obstructive pulmonary disease
- Video 27-10:** Acute infective mitral endocarditis diagnosed using transesophageal echocardiography in a patient placed under ventilator for a severe cardiogenic pulmonary edema
- Video 27-11:** Mobile thrombus of the aortic arch identified by transesophageal echocardiography in a patient presenting with coma and hemiplegia
- Video 29-1:** Aortic dissection
- Video 29-2:** Empty and filled LV
- Video 29-3:** Pulmonary embolus
- Video 29-4:** Pericardial effusion RV-impaired
- Video 29-5:** TG RV inflow
- Video 41-1:** Visualization of acute lung injury (lung consolidation with air-bronchogram and associated pleural effusion) in a patient with acute pancreatitis (right flank view)
- Video 41-2:** Sonographic detection (right subcostal view) of a free-floating inferior vena cava (IVC) thrombus (transverse axis)
- Video 41-3:** Sonographic view of the free-floating IVC thrombus (longitudinal axis) presented in Video 41-2